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| 09/368,380 | 08/04/1999 | CHRISTINE IRENE PODILCHUCK | 11-1 | 5465 |

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|---|
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| ART UNIT | PAPER NUMBER |
|---|---|
| 2613 | |

DATE MAILED: 09/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/368,380 | PODILCHUCK ET AL. | |
| | Examiner | Art Unit | |
| | Charles E Parsons | 2613 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-8,11-18 and 21-26 is/are rejected.

7)☒ Claim(s) 9,10,19,20 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed 7/08/2002 have been fully considered but they are not persuasive. The Applicant has argued that Tekalp did not teach using a constrained function to estimate a dense motion field. Upon reviewing the action the Examiner found that a typographical error was made in citing passages from the reference. The limitation is found in column 8 lines 1-17 not lines 1-7 as stated in the office action. A careful reading of these lines will clearly indicate to the Applicant that the estimation is done within a constrained area which is synonymous to a constrained function.

2. The Applicants also asserts that O'Rourke does not teach using a Markof Random Field image model in the encoder. While it may appear to be the case by only looking at the passage sited in the previous action, a further reading of column 5 and 6 will clearly show to the applicant that the discussion is related to figure 3A, which is an encoder, which furthermore uses an MRF image model.
Thus the Examiner stands by his original rejection, incorporated below with typographical errors corrected.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3 (1-13 are) rejected under 35 U.S.C. 102(b) as being anticipated by Tekalp.

Claim 1: A method for encoding an image sequence, the method comprising the steps of:

> generating an estimate of apparent motion within the image sequence utilizing a dense motion field of a portion of the image sequence, wherein the estimate comprises a plurality of motion vectors each corresponding to an element of the dense motion field, (See column 2 lines 45-50 of Tekalp)

and is generated at least in part as a constrained function of a characterization of motion between elements of the dense motion field and elements of one or more other portions of the image sequence; (See column 8 lines 1-17)

and utilizing the estimate to perform motion compensation on at least one of the images of the image sequence. (See column 8 lines 25-47)

Claim 2: The method of claim 1 wherein the image sequence comprises a sequence of video frames. (See column 2 lines 40-43)

Claim 3: The method of claim 1 further including the step of encoding the estimate such that the estimate may be transmitted to decoder for use in decoding encoded versions of one or more of the images of the sequence. (See figure 2A showing the transmission of code signals)

Claim 11: An apparatus for encoding an image sequence, the apparatus comprising:

a motion estimator operative to generate an estimate of apparent motion within the image sequence utilizing a dense motion field of a portion of the image sequence, (See figure 2) wherein the estimate comprises a plurality of motion vectors each corresponding to an element of the dense motion field, (See figure 2) and is generated at least in part as a constrained function of a characterization of motion between elements of the dense motion field and elements of one or more other portions of the image sequence; and a motion compensator having an input coupled to an output of the motion estimator, and operative to utilize the estimate to perform motion compensation on at least one of the images of the image sequence. (See figure 2A)

Claim 12. The apparatus of claim 11 wherein the image sequence comprises a sequence of video frames. (See column 2 lines 40-43 indicating that the image sequence is a sequence of video frames.)

Claim 13: The apparatus of claim 11 further including a loss less coder for encoding the estimate such that the estimate may be transmitted to decoder for use in decoding encoded versions of one or more of the images of the sequence. (See figure 2A item 110. A DCT is a loss less coder)

> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 21-26 rejected under 35 U.S.C. 102(e) as being anticipated by O'Rourke.

Claim 21: A method for encoding an image sequence, the method comprising the steps of:

generating an estimate of apparent motion within the sequence, wherein the estimate is generated at least in part utilizing a Markov random field (MRF) model to characterize motion between a given pixel of a motion field and one or more neighbor pixels; and utilizing the estimate to perform motion compensation on at least one of the images of the sequence. (See figure 3A of O'Rourke as well as column 4 line 67 through column 6 line 60.)

Claim 22: The method of claim 21 wherein the estimate comprises a plurality of motion vectors, with each of the motion vectors corresponding to a pixel of the motion field. (See figure 7 showing the motion estimation and accompanying explanation in column 10 lines 33-46)

Claim 23: The method of claim 21 wherein the neighbor pixels comprise at least one pixel in the same image as the given pixel, at least one pixel in a previous image of the sequence, and at least one pixel of a subsequent image of the sequence. (See column 5 lines 8-14)

Claim 24: An apparatus for encoding an image sequence, the apparatus comprising:

a motion estimator operative to generate an estimate of apparent motion within the sequence, wherein the estimate is generated at least in part utilizing a Markov random field (MRF) model to characterize motion between a given pixel of a motion field and one or more neighbor pixels; and a motion compensator having an input coupled to an output of the motion estimator, and operative to utilize the estimate to perform motion compensation on at least one of the images of the sequence. (See figure 7)

25. The apparatus of claim 24 wherein the estimate comprises a plurality of motion vectors, with each of the motion vectors corresponding to a pixel of the motion field. (See figure 7 as well as column 10 lines 33-46)

26. The apparatus of claim 24 wherein the neighbor pixels comprise at least one pixel in the same image as the given pixel, at least one pixel in a previous image of the sequence, and at least one pixel of a subsequent image of the sequence. (See column 5 lines 8-14)

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4-8 and 14-18 rejected under 35 U.S.C. 103(a) as being unpatentable over Tekalp as applied to claim 1 above, and further in view of O'Rourke.

Claims 4 and 14. The method/Apparatus of claim 1/11 wherein the characterization is based on a multi-scale data model which characterizes the motion as a Markov random field (MRF). (See O'Rourke column 4 line 67 through column 5 line 5 showing that he can decompress an image sequence characterized as a Markov Random field. Both inventions estimate motion using dense motion fields, also the use of Markov Random fields was well know in the art at the time the invention was made. Therefore it would have been obvious to one of ordinary skill in the art to apply the concept of Markov Random Field's to Tekalp's invention in order to obtain the current invention.)

Claim 5 and 15: The method/apparatus of claim 4/14 wherein the multi scale data model characterizes at least one of spatial coherence, temporal coherence and scale coherence of the dense motion field. (See Tekalp Column 6 lines 45-65)

Claim 6/16: The method/Apparatus of claim 4/14 wherein the multi-scale data model allows a motion vector at a coarse scale to represent an average motion over a set of pixels from a given image of the sequence to another image of the sequence. (See column 6 lines 25-60 of O'Rourke)

Claim 7/17. The method/apparatus of claim 4/14 wherein the multi scale model utilizes higher order potential functions to characterize structural properties of the dense motion field, and singleton potential functions to characterize the manner in which observations of particular types of dense motion fields affect the likelihood with which such fields occur. (See column 5 lines 8-54 of O'Rourke)

Claim 8/18. The method of claim 1/11 wherein the constrained function comprises a first maximum a posteriori (MAP) estimation problem with a constraint on the entropy of the desired estimate. (See O'Rourke column lines 54-60)

***Allowable Subject Matter***

5. Claims 9,10,19,20 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 9. The method of claim 8 wherein the generating step further includes the step of transforming the constrained function into a second MAP estimation problem having at least one parameter uniquely determined by the entropy constraint, wherein the entropy constraint is determined by an amount of bandwidth available for encoding the image sequence.

10. The method of claim 9 wherein a solution of the second MAP estimation problem minimizes a singleton potential function subject to the entropy constraint, wherein the entropy constraint is computed based on one or more higher order potential functions.

19. The apparatus of claim 18 wherein the motion estimator is further operative to transform the constrained function into a second MAP estimation problem having at least one parameter uniquely determined by the entropy constraint, wherein the entropy constraint is a function of an amount of bandwidth available for encoding the image sequence.

20. The apparatus of claim 19 wherein a solution of the second MAP estimation problem minimizes a singleton potential function subject to the entropy constraint, wherein the entropy constraint is computed based on one or more higher order potential functions.

***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles E Parsons whose telephone number is 703-305-3862. The examiner can normally be reached on M-TH 7AM to 4:30PM Fri 7AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on 703-305-4856. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4750.

CEP
September 25, 2002

CHRIS KELLEY
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600